PATIENT INTERFACE FOR REUSABLE OPTICAL SENSOR

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to U.S. Provisional Application Ser. No. 61/522,494, filed on Aug. 11, 2011, the entire disclosure of which is hereby incorporated by reference.

FEDERALLY SPONSORED RESEARCH

The work related to this subject matter was performed with government support under Grant Nos. W81XWH-08-C-0114 and W81XWH-11-C-0001 awarded by the US Army Medical Research and Materiel Command. The government may have certain rights to the invention.

BACKGROUND

Referring to FIGS. **1***a*-**1***c*, sensor assemblies **100** with foam pads and embedded sensors are used to monitor patients. See, e.g., the InSpectra™ device by Hutchinson Technology shown in FIGS. **1***a*-**1***c*, or the EQUANOX™ from Nonin Medical Inc. In such devices, a sensor shield is permanently attached to the sensor. The sensor assembly may include a foam piece with an adhesive and a liner; the foam piece may have openings for LEDs and detectors. After use, the entire sensor assembly, including the sensor, is thrown away. Such devices therefore utilize relatively unsophisticated sensor technology, limiting the usefulness and accuracy of the patient monitoring system.

SUMMARY

In one aspect, certain embodiments of the invention feature a patient interface for a reusable optical sensor. The patient interface includes a compliant element defining a pocket having an upper wall and a lower wall and configured to removably receive the reusable optical sensor, the lower wall of the pocket defining an opening therethrough, the compliant element including a first wing and a second wing configured for conformal placement on a patient's body. The compliant element includes a contact surface, and the opening extends from inside the pocket through the lower wall to the contact surface.

One or more of the following features may be included. The compliant element may include or consist essentially of open celled foam, closed cell foam, natural rubber, synthetic rubber, thermoplastic elastomer, and/or fabric. The compliant element may include a moisture impervious surface. At least one of the wings may define an opening therethrough. The compliant element may be sized and configured to conform to a portion of a patient's body, such as a deltoid, an upper arm, a calf, a thigh, a forearm, a lower back, or an upper back.

The compliant element may include a nose disposed at an end of the compliant element remote from an open end of the pocket. The nose may be angled toward the contact surface and/or may have a tapered profile to provide shielding of the optical sensor from ambient light.

The patient interface may include at least one upper wall protrusion to bias an optical sensor disposed in the pocket toward the lower wall of the pocket. At least one lower wall protrusion may be disposed proximate an entrance of the pocket to facilitate retention of the optical sensor in the pocket.

The patient interface may include an adhesive layer disposed on at least a portion of the contact surface of the compliant element. The adhesive layer may include a transfer adhesive. A removable liner may be disposed proximate the adhesive layer. The removable liner may be optically transparent.

The patient interface may further include n optically clear window aligned with the lower wall opening. The optically clear window may include an adhesive layer along at least a portion thereof. The optically clear window may include an optical tape.

The pocket may be sized to receive the sensor with a sliding interference fit.

A rigid component may be disposed along at least a portion of an outer surface of the compliant element or embedded within the element proximate the pocket. The rigid component may include or consist essentially of a plastic, a metal, and/or a composite material to protect the optical sensor.

The compliant element may include or consist essentially of fabric. The patient interface may further include a first strap attached to one of the two wings, the first strap being configured for encircling a portion of a patient's body. A fastener may be attached to an other of the two wings, adapted to receive and secure the first strap. A second strap may be attached to the other of the two wings and the fastener may be attached the second strap. The first strap may include a hook-and-loop fastener. The lower wall of the pocket may include a non-slip material.

In another aspect, embodiments of the invention include a method of monitoring a condition of a patient. The method includes inserting an optical sensor into a patient interface, and applying the patient interface to the patient. A measurement is obtained with the optical sensor related to the condition of the patient. The patient interface is removed from the patient, and the sensor is removed from the patient interface.

The patient interface may be disposed of, and the optical sensor reused in a new patient interface to obtain an additional measurement.

BRIEF DESCRIPTION OF DRAWINGS

FIGS. **1***a*-**1***c* are schematic drawings illustrating a prior art sensor assembly;

FIGS. **2***a*-**2***b* includes schematic solid model, exploded, and cross-sectional views of a patient interface, in accordance with an embodiment of the invention;

FIG. **3** is a schematic view of a patient interface with a thinned nose with a pocket, in accordance with an embodiment of the invention;

FIGS. **4***a*-**4***b* include schematic plan, side, bottom, end, and cross-sectional views of a patient interface, in accordance with an embodiment of the invention;

FIG. **5** is a schematic view of a protrusion in the form of an oblong feature, in accordance with an embodiment of the invention;

FIG. **6** is a schematic view of protrusions added to a pocket of a patient interface, in accordance with an embodiment of the invention;

FIGS. **7***a*-**7***b* are schematic views of an adhesive stack including a transfer adhesive, an optical tape, and a removable liner; and

FIGS. **8**-**10** are schematic perspective views of a sensor being inserted into a pocket of a patient interface, in accordance with an embodiment of the invention;

FIGS. **11***a*-**11***c* are schematic solid model views of a patient interface in accordance with an embodiment of the invention;